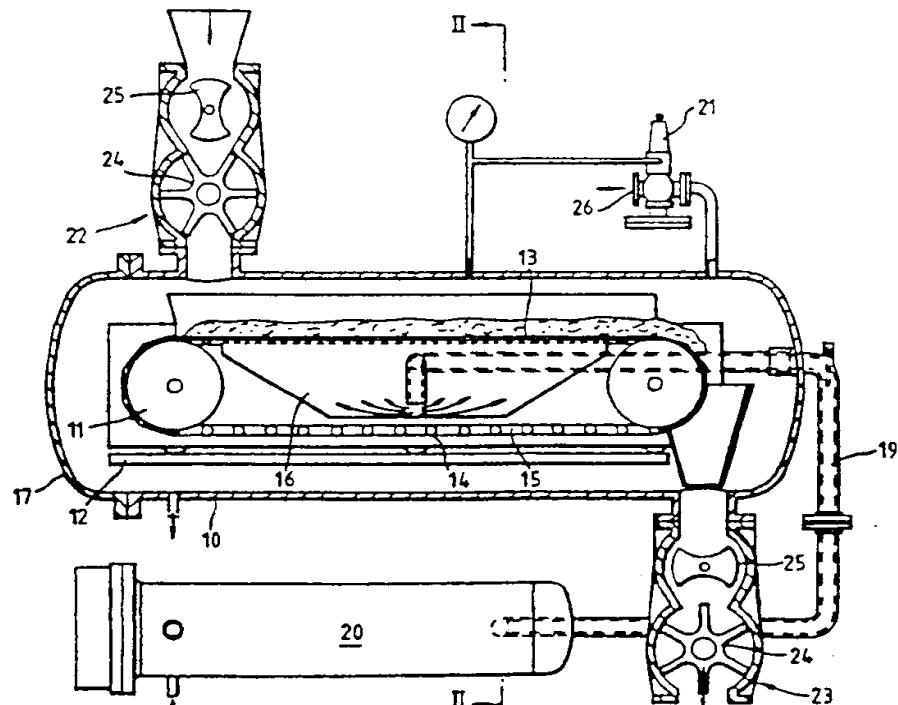


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: IMPROVEMENTS IN OR RELATING TO THE TREATMENT OF TOBACCO



## (57) Abstract

An apparatus for expanding tobacco products comprising a pressure vessel (10) having conveyor means (11) therein to carry tobacco products through the vessel, means to supply steam under pressure to the vessel to heat tobacco products on the conveyor, and steam trap inlet and outlet means (22, 23) arranged respectively to allow tobacco products to be passed into the vessel to the conveyor means, and from the vessel to be released to atmospheric pressure while maintaining the steam pressure within the vessel.

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- 1 -

TITLE: IMPROVEMENTS IN OR RELATING TO  
THE TREATMENT OF TOBACCO

This invention relates to the expansion of tobacco products, more particularly, the expansion of the midrib of the tobacco leaf after cutting or shredding. This material is often referred to as cut stem.

The object of the invention is to restore the cell size of the living stem, which was lost by shrinkage during curing.

The prior art process used for this involves two stages:-

1. Conditioning to add moisture and heat and expand the tobacco.
2. Drying to maintain and fix the expansion.

Adding moisture swells the cells and steam heating creates a vapour pressure within the cell which expands it. To be effective the vapour must be generated more rapidly than it can diffuse through the cell walls, and is created by rapid heating under humid conditions.

A pressure difference can also be created across the cell by first heating and then reducing the external pressure or heating under pressure then decompressing.

Heat and moisture are necessary to soften the structure and permit expansion. Drying below 16% and cooling are necessary to harden the structure and fix

- 2 -

the expansion.

So far this has always been carried out on a batch basis in a sealed pressure vessel.

It is a particular object of the invention to provide an apparatus for expanding tobacco products on a continuous basis.

Accordingly the present invention provides apparatus for expanding tobacco products comprising a pressure vessel having conveyor means therein to carry tobacco products through the vessel, means to supply steam under pressure to the vessel to heat tobacco products on the conveyor, and steam trap inlet and outlet means arranged respectively to allow tobacco products to be passed into the vessel to the conveyor means, and from the vessel to be released to atmospheric pressure while maintaining the steam pressure within the vessel.

Preferably said inlet and outlet steam locks each comprises a cell wheel and an arrester arranged to be driven in synchronism by an intermittent motion means so that when the cell wheel is in a stationary position to receive tobacco products in a cell, the arrester moves through an open position to allow products to pass to the cell, and when the arrester has moved on to a closed position, the cell wheel indexes to present a fresh cell in such open position.

In order to promote a fuller understanding of the

- 3 -

above and other aspects of the present invention, an embodiment will now be described, by way of example only, with reference to the accompanying drawings in which:

FIGURE 1 shows a schematic side view of a tobacco treating apparatus, and

FIGURE 2 shows a schematic cross-section on the line III-II in Figure 1.

The apparatus provides a pressure vessel in which tobacco may be heated in steam under pressure, with means for supplying tobacco to the vessel and removing tobacco from the vessel in a continuous flow, with the tobacco remaining in the vessel for a chosen heating period; while maintaining an effective seal at the supply and exit points in the vessel so that steam pressure may be maintained in the vessel. On leaving the vessel the tobacco is released to atmospheric pressure resulting in expansion, and then dried and cooled by conventional means.

In the embodiment of Figures 1 and 2, a pressure vessel 10 with inlet and outlet rotary air locks is provided to enclose the tobacco handling means indicated generally at 11 and enable the tobacco to be heated by steam under pressure for a fixed time, then released to atmospheric pressure to provide expansion. In its simplest form a gauze band conveyor handling means would be used. Various other possibilities (not

- 4 -

shown) for the tobacco handling means include:-

1. A screw conveyor with steam passing axially through the conveyor in the same direction or opposite direction to the tobacco. Or with steam entering radially from a central hollow axis of the screw.

2. A vibratory conveyor with perforated tray bottom and plenum chamber to pass steam up through the tobacco layer.

3. A rotary cylinder with axis inclined at a small angle to the horizontal and internal paddles to transport the tobacco. The steam passing axially through the cylinder with the tobacco flow or against it.

In Figures 1 and 2 the conveyor 11 comprises a gauze band 13 is carried by stay bars 14 between conveyor chains 15 to avoid tracking problems. The gauze passes over a steam plenum chamber 16 with a perforated top to distribute the steam flow through the tobacco.

The pressure vessel 10 is fitted with an access door 17 and the whole conveyor is mounted by means of rollers on rails 12 so that it can be easily withdrawn for maintenance. The drive (not shown) for the conveyor is external to the vessel 10 and drives the conveyor through a dog clutch 18.

This approach handles the tobacco gently and can give substantial pressure drops. Saturated steam very

- 5 -

slightly super heated to prevent wetting the outside layers of the tobacco is blown through the tobacco layers and then recirculated or as the surplus is small discharged from the vessel 10.

The heating process is a condensation process, and high temperatures are reached, so it is self limiting and heating times are not critical. In fact times will be determined by the tobacco loading and steam flow rate. With 2,000 kg/hr of tobacco and 500 kg/hr of steam through a  $0.5\text{m}^2$  gauze band the tobacco will reach equilibrium in less than 15 seconds within the chamber.

Saturated steam temperatures used are up to  $155^{\circ}\text{C}$  at 4 bar, with additional superheat, and can be controlled accurately. After decompression the temporary moisture addition will be no higher than normal, up to 5%, but could be limited by further super heating the steam. Air would be eliminated and only the steam required to condition the tobacco and replace air lock leaks would be required, approximately 0.2 kg/hr of steam per 1.0 kg of CRS, so it would be economical.

Steam is supplied from a source (not shown) by way of an inlet conduit 19 to the vessel 10. An electric superheater 20 is included in the process steam supply, to ensure that the steam is dry. (Wet steam is filtered by the tobacco causing an undesirable soggy bottom layer to the tobacco). It also permits some

- 6 -

tobacco drying to be achieved during the expansion process.

A surplussing valve 21 maintains a constant pressure within the pressure vessel by venting the surplus steam to an outlet 26.

The success of this apparatus depends on producing satisfactory rotary steam locks. To achieve this a special design of steam lock is provided at the inlet and outlet of the vessel as indicated at 22 and 23 in Figure 1, with the object of keeping tobacco away from the sealing rotor blade tips, thus reducing gumming.

Each steam lock 22, 23 comprises a cell wheel 24 which is stationary whilst a rotary arrester 25 is moving, as shown at the input position in Figure 1. The cell wheel and arrester are driven intermittently in synchronisation. The cell wheel is driven by a 60° indexer and the arrester by a 180° indexer.

The cell wheels 24, in this embodiment each having six cells, are arranged to be a close clearance fit in a rotary housing chamber so that there is little escape of steam past the tips of the blades of the cells. The arresters 25 are 2-lobed rotors with a wide clearance in their respective housing chambers. The arresters 25 are driven in synchronism with the cell wheels 24 so that when a cell of the cell wheel 24 is in an "open" position ready to receive tobacco, it momentarily stops while the arrester 25 moves to its "open" position to

- 7 -

allow tobacco to pass into the cell. The arrester 25 then moves to its "closed" position and the cell wheel indexes by one cell for the process to be repeated.

By this means the inlet and outlet steam locks always provide a steam barrier to maintain pressure in the vessel 10, while allowing tobacco to pass into and out of the vessel in a continuous process.

As the tobacco is heated by 'inert' steam and for a relatively short time, the method may be applicable to lamina.

Normally the tobacco stems would be fed into the chamber at cutting moisture so it is not necessary to add permanent water in the pressure conditioner.

CLAIMS

1. Apparatus for expanding tobacco products comprising a pressure vessel having conveyor means therein to carry tobacco products through the vessel, means to supply steam under pressure to the vessel to heat tobacco products on the conveyor, and steam trap inlet and outlet means arranged respectively to allow tobacco products to be passed into the vessel to the conveyor means, and from the vessel to be realeased to atmospheric pressure while maintaining the steam pressure within the vessel.

2. An apparatus as claimed in Claim 1, wherein said inlet and outlet means each comprises a cell wheel and an arrester arranged to be driven in synchronism by an intermittent motion means so that when the cell wheel is in a stationary position to receive tobacco products in a cell, the arrester moves through an open position to allow products to pass to the cell, and when the arrester has moved on to a closed position, the cell wheel indexes to present a fresh cell in such open position.

3. An apparatus as claimed in Claim 2, wherein each said arrester comprises a two lobed rotary device.

4. An apparatus as claimed in Claims 2 or 3, wherein each said cell wheel comprises a six celled rotor.

- 9 -

5. An apparatus as claimed in any preceeding Claim, wherein said conveyor means comprises a wire gauze band supported by spaced bars carried between two chains arranged to be supported and driven within the vessel.

6. An apparatus as claimed in Claim 5, wherein said conveyor means is driven from outside the vessel by a shaft passing through the wall of the vessel.

7. An apparatus as claimed in Claim 6, wherein said conveyor is coupled to said shaft by means of a dog clutch.

8. An apparatus as claimed in Claim 5, 6 or 7 wherein a plenum chamber for the distribution of steam is provided beneath the run of the conveyor gauze, the plenum chamber being connected to a source of steam outside the vessel.

9. An apparatus as claimed in any preceeding claim, wherein said means for supply steam includes means to superheat the steam.

10. An apparatus as claimed in any preceeding claim wherein said vessel is provided with a steam outlet controlled by a valve to allow surplus steam to leave the vessel.

11. An apparatus as claimed in any preceeding claim wherein said vessel is provided at one end with a removable door so that the conveyor means may be removed for cleaning and maintenance.

- 10 -

12. An apparatus as claimed in Claim 8, wherein said conveyor means is supported by means of rollers running upon rails in the vessel to facilitate such removal.

1/2

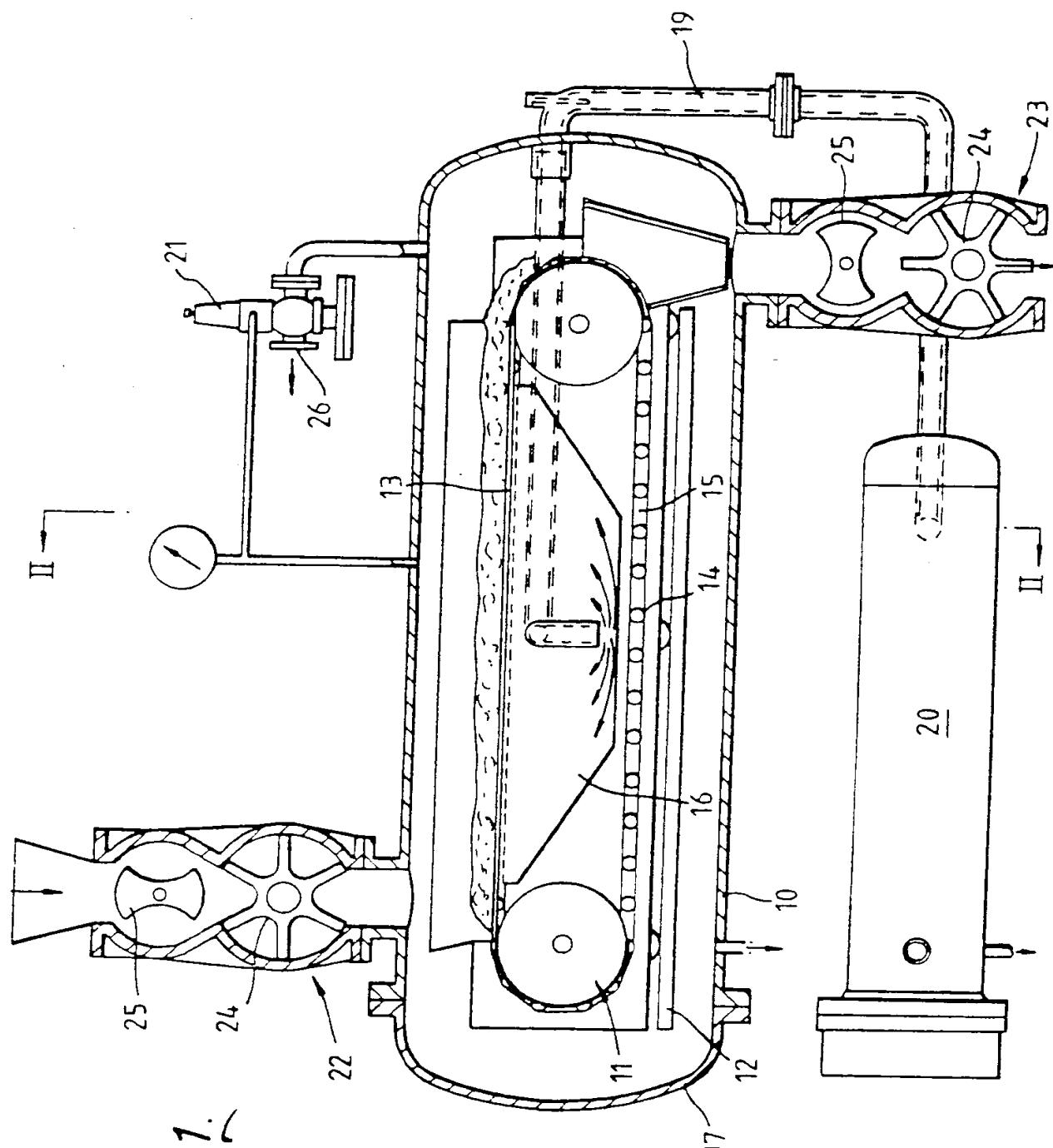


Fig. 1.

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2/2

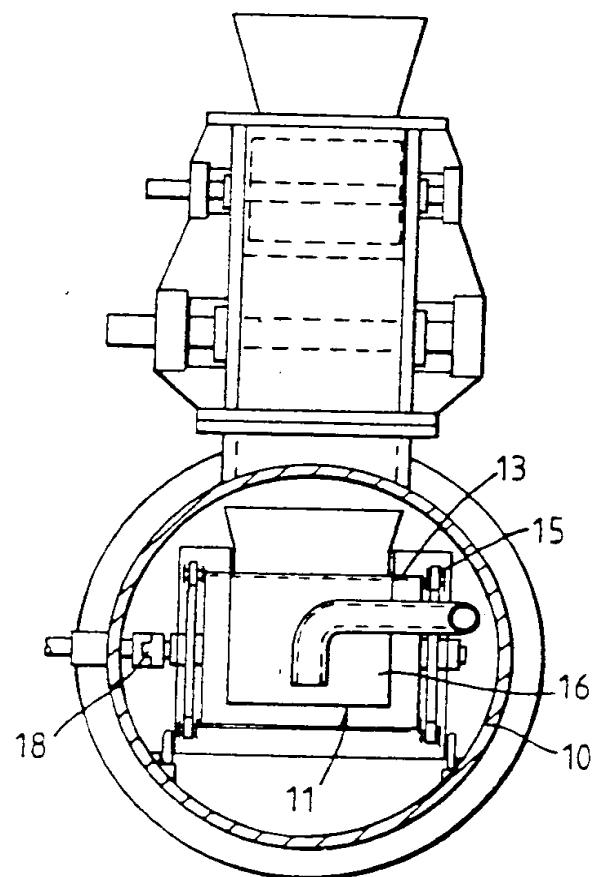


Fig. 2.

**SUBSTITUTE SHEET**

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 87/00405

**I. CLASSIFICATION OF SUBJECT MATTER** (if several classification symbols apply, indicate all)

According to International Patent Classification (IPC) or to both National Classification and IPC

 IPC<sup>4</sup>: A 24 B 3/18

**II. FIELDS SEARCHED**

 Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
IPC <sup>4</sup>	A 24 B

 Documentation Searched other than Minimum Documentation  
 to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>
**III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>**

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
Y	US, A, 4561453 (ROTHCHILD) 31 December 1985 see figures 1-3; columns 3-6	
A	--	1,9,10 2,4
Y	US, A, 4211243 (OHNO) 8 July 1980 see abstract	--
A	GB, A, 675292 (GUARDITE CORP.) 9 July 1952 see claims 1,3	--
A	GB, A, 730527 (KORBER) 25 May 1955 see figure 1; page 3, lines 59-71	1 1

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"Z" document member of the same patent family

**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

8th September 1987

Date of Mailing of this International Search Report

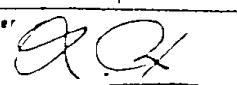
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 87/00405 (SA 17524)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 16/09/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4561453	31/12/85	None	
US-A- 4211243	08/07/80	JP-A- 53104797	12/09/78
GB-A- 675292		None	
GB-A- 730527		None	